

A-34

Evidence for an Electron Nematic Phase Transition in Underdoped Iron Pnictide Superconductors

Jiun-Haw Chu^{1,2}, J. G. Analytis^{1,2}, K. De Greve³, P. L. McMahon³, Zahirul Islam⁴, Yoshihisa Yamamoto^{3,5}, and I. R. Fisher^{1,2}

¹Department of Applied Physics and Geballe Laboratory for Advanced Materials, Stanford University, Stanford, CA 94305

²Stanford Institute of Energy and Materials Science, SLAC National Accelerator Laboratory, 2575 Sand Hill Road, Menlo Park, CA 94025

³E. L. Ginzton Laboratory, Stanford University, Stanford, CA 94305

⁴The Advanced Photon Source, Argonne National Laboratory, Argonne, IL 60439

⁵National Institute of Informatics, Hitotsubashi 2-1-2, Chiyoda-ku, Tokyo 101-8403, Japan

High-temperature superconductivity often emerges in the proximity of a symmetry breaking ground state in strongly interacting electronic materials. In the case of the superconducting iron pnictides, in addition to the antiferromagnetic groundstate of the parent compounds, an ubiquitous but small structural distortion breaks the crystal's C4 rotational symmetry in the underdoped part of the phase diagram. Here we report measurements of the in-plane resistivity anisotropy of detwinned crystals of the representative iron pnictide $\text{Ba}(\text{Fe}_{1-x}\text{Co}_x)_2\text{As}_2$. We find that the resistivity along the shorter b-axis develops an insulating temperature dependence, while the resistivity along the longer a-axis remains metallic. This conspicuous resistivity anisotropy bears witness to a dramatic electron nematic phase transition, with consequences for the electronic structure and also the superconducting pairing mechanism.